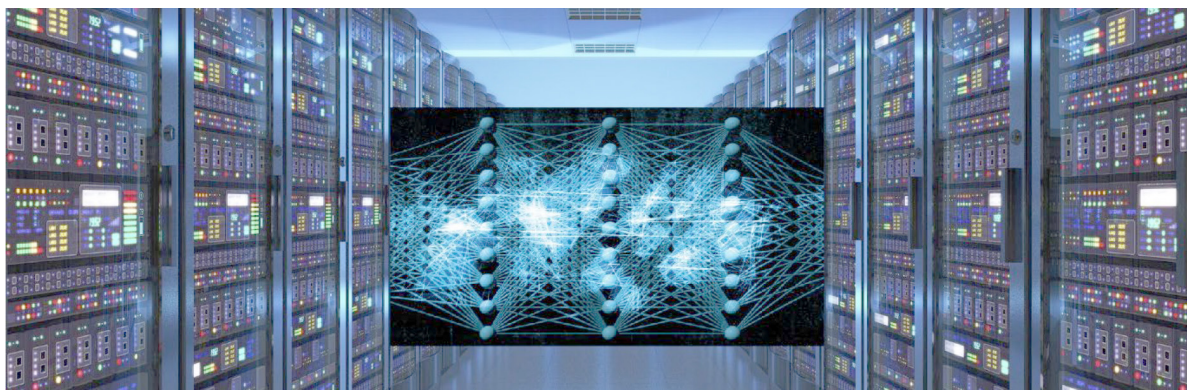


Predicting next item interaction with session aware and session based Recommendation Systems

Shaik Mohammad Yunus Ansari

Pursuing Masters in the Stream of Data Science at JNTU Gurajada Vizianagaram . Email: yunus00939@gmail.com



Picture Courtesy: <https://telanganatoday.com/hyderabad-ideal-to-set-up-data-centres>
<https://voith.com/corp-en/news-room/stories/how-artificial-intelligence-works.html>

Recommender System

We live in a digital world where we can access to varieties of information and every application and machines are being automated with AI computer algorithms. These algorithms are used in various online applications like Ecommerce, Music, Video-Streaming etc, the main advantage of using Artificial Intelligence in these fields helps businesses to gain profits by understanding the customer or user behaviour, understanding latest trends, incorporating best strategies into their applications to grow their business.

Recommender systems plays an important role in an online e-commerce websites and media streaming websites which are widely used where it helps to find the individual user interests and providing suggestions. Every recommendation system main goal is to provide personalized recommendation which is relevant to the user interest.

These recommendations can be attained by different types of methods where every system works with an input to provide a definite output. Every business uses their own strategy which personalizes the recommendation system to understand the individual user-interest by different factors like age, gender, demographic location, past user interaction data etc, because there are more than 7 million of people possessing different behaviour and it is little tricky to predict the exact behaviour but with these

input factors we can assume that this type of users may have some similarities. For example, a new user has signed up to an online shopping application by not providing complete information. Being a new user there will be no past information which makes system to experience cold start problem which means not understanding which suggestion to be provided.

With the few interactions with the items the system recognizes the pattern and can provide suggestions with the help of Collaborative-filtering technique.

Ex. Being anonymous. By providing incomplete information to the recommender, it cannot be able to provide accurate suggestions and there are also several other factors which recommender system is affected like concept drift, data sparsity etc. Even though, the user doesn't provide any input data, or effected by various factors the successful recommendation system has to provide suggestions precisely to user interest.

Deep Learning in Recommender Systems

Recently, deep learning is applied to recommender systems because these recommender systems are applied almost all the online websites which is having different types of data format. There are two types of data ie., structured and unstructured data mostly of the information available online. Structured data is textual data like reviews, tweets, gradings, ratings etc and unstructured data is image data

like social posts, product images etc, it is impossible to draw suggestions for these types of information so deep learning models play an important role for those types of recommender systems. Deep learning is typically regarded as a subfield of machine learning.

Content Based Filtering

Based on the previous actions of the user or feedback given to the product/item, Content based filtering uses item features with which similar items or products are recommended.

Collaborative Filtering

This filtering finds similarities between users and items i.e., user to user, item to item, item to user simultaneously to recommend the products to the user.

Hybrid Filtering

It is the combination of both content and collaborative filtering

Types of similarity measures: Using distance metric the similarities are identified and those are categorized relevant or irrelevant using distance. The distance can be calculated by using Minkowski distance, Manhattan distance, Euclidean distance, Cosine similarity, Pearson coefficient, Jaccard Similarity, Hamming distance.

Deep learning is commonly defined as learning deep representations or learning several levels of representations and abstractions from data. It improves a differentiable objective function using a stochastic gradient descent variation (SGD). Both supervised and unsupervised learning tasks have seen significant success using neural architectures. Some of the deep learning techniques are Multilayer perceptron, CNN (Convolutional Neural Network), RNN (Recurrent Neural Network), Auto Encoders, DRL (Deep Reinforcement Learning) etc.

Sequential recommendation system:

These systems rely on traditional user-item rating matrix as an input. The goal is to predict immediate next user-item or point of interest that user will interact from the time stamped rating matrix of sequence of events in data.

Session-based recommendation system:

This system predicts the next user action present on the ongoing interactions of current session. In this system users are anonymous which deals with first time users or users who are not logged in. The input of these systems are recorded user interactions arranged according to time

ordered.

Session-aware recommendation system:

This system is also known as personalized session based because the main goal is also identical but users are known in this system, ex: users who are logged in. In this system recommendations are personalized with user past behaviour which can be beneficial for accuracy.

Several researches were conducted to understand what represents the state-of-the-art by evaluating different neural approaches. Comparisons were made by comparing newly proposed session-aware with existing session-based models which do not use a consistent set of baseline algorithms, so still research is scattered. The main idea is to combine the user's long term and short term intents which can relate to the better accurate suggestion so we have compared five recent neural models like HGRU4REC, IIRNN (Inter-session and Intra-session Recurrent Neural Network), SHAN (Sequential Recommender System based on Hierarchical Attention Network), NCSF, NSAR (Neural Session-Aware Recommendation) with set of existing neural and non-neural approaches to session based and heuristic extensions like Extend, Boost and Remind of session based techniques which uses interactions in ongoing sessions. Nearest neighbors in session based are also used because they are very competitive.

Four datasets Cosmetics, Lastfm, Retail, Xing which are publicly available were considered in this experiment. Surprisingly, heuristic extensions of existing session-based algorithms were best performing. In many cases nearest neighbors outperform recent session aware models although they do not use long term users intents.

With the analysis of several neural, non-neural and nearest neighbors baseline results, the session aware which combines users' long term and short-term intents can be able to provide accurate suggestions if they were developed and still has huge potential to be state-of-the-art in predicting next user item interaction.

References

- [1] <https://www.sciencedirect.com/science/article/pii/S0020025521005089>
- [2] <https://analyticsindiamag.com/collaborative-filtering-vs-content-based-filtering-for-recommender-systems/>
- [3] <https://arxiv.org/pdf/1707.07435>

About the Author



S M Yunus Ansari is currently pursuing his masters in the stream of Data Science at JNTU Gurajada Vizianagaram and completed his bachelors at KL University, Guntur. His fascination is towards practices in neural structures of deep learning in the domain of recommender systems and his current research interest lies in Data Science, Machine Learning and Deep Learning.